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SDMS Document ID



1001498

MALONONITRILE

HAZARDTEXT(R) - Hazard Management

1.0 IDENTIFICATION

1.1 SYNONYMS

MALONONITRILE
CYANOACETONITRILE
DICYANOMETHANE
DWUMETYLOSULFOTLENKU (Polish)
MALONIC ACID DINITRILE
MALONIC DINITRILE
MALONODINITRILE
METHANE, DICYANO-
METHYLENE CYANIDE
METHYLENE DINITRILE
NITRIL KYSELINY MALONOVE (Czech)
PROPANEDINITRILE

1.2 IDENTIFIERS

1.2.1 CAS REGISTRY NUMBER:

CAS 109-77-3

1.2.2 NIOSH/RTECS NUMBER:

NIOSH/RTECS OO 3150000

1.2.3 UN/NA NUMBER:

2647 - Malononitrile

1.2.5 DESIGNATIONS:

RCRA WASTE NUMBER: U149
USAF A-4600
USAF KF-19

1.2.6 MOLECULAR FORMULA:

C3-H2-N2

1.2.7 ERG2000 GUIDE NUMBER:

153 - SUBSTANCES - TOXIC AND/OR CORROSIVE

(COMBUSTIBLE)

1.3 SYNONYM REFERENCE

A. EPA, 1985; HSDB, 1990; RTECS, 1990

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3.0 CLINICAL EFFECTS

3.1 GENERAL CLINICAL EFFECTS

- A. Malononitrile is a cyanogenic aliphatic nitrile compound, previously used as a treatment for schizophrenia and depression.
1. When administered to humans intravenously for the treatment of mental illness in doses of 1 to 6 milligrams/kilogram, symptoms of tachycardia, local redness, nausea, vomiting, headaches, shivering and muscle spasms, a sensation of numbness, convulsions, and cardiac collapse were noted.
 2. Restlessness, severe dyspnea, cyanosis, lethargy, tremors, incoordination, and convulsions have been seen in experimental animals administered fatal or near-fatal doses of malononitrile. Oral administration to mice caused gastric mucosal injury.
 - a. Pathologic lesions in the spinal ganglia, corpus callosum, and optic nerves and tracts have been seen in rats poisoned with malononitrile, and postulated to be due to tissue anoxia caused by metabolically released cyanide. These effects have not been reported in exposed humans.
- B. The systemic toxicity of malononitrile is due to metabolic release of cyanide by hepatic metabolism following absorption. The onset of symptoms is generally delayed for up to several hours after exposure, thus making a **PROLONGED PERIOD OF OBSERVATION** in a **CONTROLLED SETTING NECESSARY**.
- C. Malononitrile causes severe eye irritation and has caused irritation of the gastric mucosa in experimental animals following ingestion; it also causes skin irritation, and has caused liver and renal injury in experimental animals. Pulmonary irritation has occurred in mice inhaling malononitrile vapors.
- D. Chronic occupational exposure to other similar nitrile compounds such as acetonitrile has resulted in interference of iodine uptake by the thyroid and some cases of goiter, presumably by interference of thiocyanate produced during normal cyanide detoxification by the endogenous rhodanese enzyme. Whether this occurs with malononitrile exposure is unknown.
- E. The remainder of this discussion relates to **CYANIDE POISONING** and **TREATMENT**. The possibility of **DELAYED ONSET** of **SYMPTOMS**, up to **SEVERAL HOURS AFTER MALONONITRILE EXPOSURE** must be kept in mind. **PROLONGED OBSERVATION** is usually required for initially asymptomatic individuals with aliphatic nitrile exposure.
- F. Lesser cyanide exposures may produce nausea, vomiting, palpitations, confusion, hyperventilation, anxiety, and vertigo. Severe hypoxic signs in the absence of cyanosis suggest the diagnosis. Patients have survived potentially lethal cyanide exposures with supportive care only, and the absence of a rapidly deteriorating course does not exclude the diagnosis.
1. Cyanosis is generally a late finding and does not occur until the stage of circulatory collapse and apnea. Initially the patient may experience flushing, tachycardia, tachypnea, headache, and dizziness. This may progress to agitation, stupor, coma, apnea, generalized

- convulsions, pulmonary edema, bradycardia, hypotension, and death.
- G. If systemic CYANIDE POISONING is suspected, IMMEDIATELY BEGIN ADMINISTERING 100% OXYGEN. OBTAIN THE CYANIDE ANTIDOTE KIT AND PREPARE IT FOR USE.
- H. ERG2000 INFORMATION
1. HEALTH HAZARDS - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
 - a. TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
 - b. Contact with molten substance may cause severe burns to skin and eyes.
 - c. Avoid any skin contact.
 - d. Effects of contact or inhalation may be delayed.
 - e. Fire may produce irritating, corrosive and/or toxic gases.
 - f. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.
 - g. Reference: ERG, 2000.

3.2 ACUTE CLINICAL EFFECTS

- A. From its acute oral LD50 of 19 mg/kg in mice (RTECS, 1993), malononitrile is an EXTREMELY TOXIC compound. It is a skin irritant and a severe eye irritant (RTECS, 1993; Sax & Lewis, 1989; Hartung, 1982). Vapor inhalation caused lung irritation in mice (Alarie, 1981). Malononitrile can be absorbed through intact skin, leading to systemic cyanide poisoning (Hartung, 1982; Sax & Lewis, 1989; HSDB, 1993).
- B. When administered to humans intravenously for the treatment of mental illness in doses of 1 to 6 mg/kg, symptoms of tachycardia, local redness, nausea, vomiting, headaches, shivering, muscle spasms, a sensation of numbness, seizures, and cardiac collapse were noted (Hartung, 1982; HSDB, 1993). Restlessness, severe dyspnea, cyanosis, lethargy, tremors, incoordination, and seizures have been seen in experimental animals administered fatal or near-fatal doses of malononitrile (Hartung, 1982). Oral administration caused gastric mucosal injury in mice (Hartung, 1982).
- C. An important aspect of the acute toxicity of nitriles is the possible DELAYED ONSET of signs and symptoms, due to the time required to form cyanide by metabolism (Hartung, 1982). When malononitrile was injected into mice, most deaths occurred about 5 to 7 hours afterwards (Willhite & Smith, 1981).
- D. The fatal dose of cyanide salts is estimated at 200 to 300 milligrams for an adult (Bonnichsen & Maely, 1966; Baselt & Cravey, 1989). As little as 180 milligrams can be rapidly fatal (CHRIS, 1993). Inhalation of 200 to 300 ppm is rapidly fatal (ACGIH, 1986). However, individuals have survived exposure to much higher airborne concentrations or ingested doses of cyanide, as well as complete immersion in cyanide solutions (Yacoub et al, 1974; Hall et al, 1987; Bismuth et al, 1984; Dodds & McKnight, 1985).
- E. Cyanide causes signs and symptoms of flushing, nausea, vomiting, palpitations, rapid heartbeat and breathing, headache, dizziness, confusion, hyperventilation, hypertension, hypotension, cardiac arrhythmias and conduction defects, metabolic acidosis, seizures, anxiety, agitation, tremors, weakness, stupor, respiratory depression, and coma (Hall & Rumack, 1986). Death may occur within a few minutes following CYANIDE exposure, but may be delayed for hours following nitrile exposures.
- F. Damage to the optic nerve has also been produced in rats within 48 hours after a single injection of sodium cyanide; damage from a single exposure was progressive (Lessell & Kuwabara,

1974). A Parkinsonian-like syndrome has also occurred up to several weeks after acute cyanide exposure (Rosenberg et al, 1989). CNS symptoms may be reversible up to a point (Wuthrich, 1954), but some symptoms can persist for many months following exposure (Pettigrew et al, 1977).

- G. Pathologic lesions in the spinal ganglia, corpus callosum, and optic nerves and tracts have been seen in rats poisoned with malononitrile (Hartung, 1982; Grant, 1986; HSDB, 1993; Hicks, 1950). The lesions were postulated to be due to tissue anoxia caused by metabolically released cyanide (Hicks, 1950). These effects have not been reported in exposed humans.
- H. Acute exposure to malononitrile has caused liver and renal injury in experimental animals (HSDB, 1993).

3.3 CHRONIC CLINICAL EFFECTS

- A. At the time of this review, no studies were found on chronic malononitrile exposure in humans.
- B. Chronic occupational exposure to other similar nitrile compounds such as ACETONITRILE has resulted in interference of thyroid iodine uptake by the cyanide metabolite, thiocyanate, and some cases of goiter (Hartung, 1982). Whether this occurs with chronic malononitrile exposure is unknown.
- C. Chronic occupational cyanide exposure has been associated with a variety of dermal and mucous membrane irritant complaints, usually attributed to exposure to highly alkaline aerosols or solutions of cyanide salts (Finkel, 1983; Hartung, 1982; Proctor et al, 1988).
- D. True chronic cyanide toxicity in humans is rare (Proctor et al, 1988), although a variety of complaints including goiter, subclinical thyroid function, B12, and folate abnormalities, headaches, vertigo, chest discomfort, palpitations, eye and respiratory tract irritation, dermatitis, fatigue, poor appetite and sleeping, and epistaxis have been reported in cyanide-exposed workers (Proctor et al, 1998; Colle, 1972; Saia et al, 1970; Ermans et al, 1972; Blanc et al, 1985).
- E. Chronic exposure to cyanides has been reported to cause CNS effects, such as insomnia, loss of memory, and tremors (Chaumont, 1960). Experimental animal studies have confirmed the central nervous system as a target for chronic cyanide toxicity. Rats fed cyanide for 11 months had damage to the spinal cord (Philbrick et al, 1979). Other neurological effects include degeneration of the optic nerve resulting in decreased visual acuity or blindness.
- F. In rats, cyanide metabolites may accumulate over long periods of chronic exposure (Tewe & Maner, 1981).

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7.0 STANDARDS AND LABELS

7.1 WORKPLACE STANDARDS

- A. ACGIH-TLV: Not Listed (ACGIH, 2000)
- B. OSHA PEL: Not Listed (OSHA, 1996a)
- C. OSHA List of Highly Hazardous Chemicals, Toxics and Reactives: Not Listed (OSHA, 1996)
- D. NIOSH VALUES: (NIOSH, 1996)
 - 1. REL: 3 ppm (8 mg/m(3)) TWA; no STEL
 - a. Skin Notation: Not Listed
 - b. NOTE: A TWA concentration is for up to a 10-hour work-day during a 40-hour workweek. A STEL value is a 15 minute TWA exposure that should not be exceeded at any time during a workday. A Ceiling value should not be exceeded at any time.
 - 2. IDLH VALUE: Not Yet Determined
 - a. Carcinogen: Not Listed
- E. AIHA WEEL VALUE: Not Listed (AIHA, 1996)

7.2 ENVIRONMENTAL STANDARDS

- A. SARA TITLE III
 - 1. EHS (EXTREMELY HAZARDOUS SUBSTANCES) LIST: Listed (EPA, 1996f)
 - a. RQ* (Reportable Quantity):
 - 1. 1000 pounds *Only the statutory or final RQ is shown. For more information see 40 CFR Table 302.4.
 - b. TPQ (Threshold Planning Quantity):
 - 1. 500/10,000 pounds
 - 2. SECTION 313: Listed (EPA, 1996g)
 - a. Effective Date: 1/1/94
- B. CERCLA; HAZARDOUS SUBSTANCES and REPORTABLE QUANTITIES: Listed (EPA, 1996e)
 - 1. Statutory RQ (Reportable Quantity):
 - a. 1* pound - (1* Indicates that the 1-pound RQ is a CERCLA statutory RQ).
 - b. Codes: Listed
 - 1. 4 - Indicates that the statutory source for designation of this hazardous substance under CERCLA is RCRA Section 3001.
 - 2. Final RQ (Reportable Quantity):
 - a. 1,000 pounds (454 kilograms)
 - b. Notes: Not Listed
 - c. Final RQ Category: C

- C. RCRA HAZARDOUS WASTE NUMBER: Listed (EPA, 1996; EPA, 1996a; EPA, 1996b; EPA, 1996c; EPA, 1996d)
 - 1. waste number U149
- D. TSCA INVENTORY: Listed (LOLI, 1996)
- E. AIHA ERPG VALUES: Not Listed (AIHA, 1996)
- F. DOT List of Marine Pollutants: Not Listed (DOT, 1996a)

7.3 SHIPPING REGULATIONS

7.3.1 SURFACE

- A. Table of Hazardous Materials and Special Provisions: Listed (DOT, 1996)
 - 1. Hazardous materials descriptions and proper shipping name: MALONONITRILE
 - a. Symbol(s): Not Listed
 - 2. Hazard class or Division: 6.1 6.1: Poisonous materials
 - 3. Identification Numbers: UN2647
 - 4. Packing group: II
 - 5. Label(s) required (if not excepted): POISON
 - 6. Special provisions: Not Listed
 - 7. Packaging authorizations:
 - a. Exceptions: None
 - b. Non-bulk packaging: refer to section 173.212
 - c. Bulk packaging: refer to section 173.242
 - 8. Quantity limitations:
 - a. Passenger aircraft or railcar: 25 KG
 - b. Cargo Aircraft only: 100 KG
 - 9. Vessel stowage requirements:
 - a. Vessel stowage: A A: Stowage category "A" means the material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.
 - b. Other stowage provisions: 12 12: Keep as cool as reasonably practicable.

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10.0 PHYSICAL HAZARDS

10.1 FIRE HAZARD

10.1.1 SUMMARY

A. FIRE OR EXPLOSION HAZARDS - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153

1. Combustible material: may burn but does not ignite readily.
2. When heated, vapors may form explosive mixtures with air: indoors, outdoors, and sewers explosion hazards.
3. Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.
4. Contact with metals may evolve flammable hydrogen gas.
5. Containers may explode when heated.
6. Runoff may pollute waterways.
7. Substance may be transported in a molten form.
8. Reference: ERG, 2000.

B. PUBLIC SAFETY, GENERAL - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153

1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number:
2. CANADA:
 - a. CANUTEC: 613-996-6666 (Collect calls are accepted); *666 cellular (in Canada only).
3. UNITED STATES:
 - a. CHEMTREC(R): 1-800-424-9300 (Toll-free in the U.S., Canada and the U.S. Virgin Islands); 703-527-3887 for calls originating elsewhere (Collect calls are accepted).
 - b. CHEM-TEL, INC.: 1-800-255-3924 (Toll-free in the U.S., Canada and the U.S. Virgin Islands); 813-248-0585 for calls originating elsewhere (Collect calls are accepted).
 - c. INFOTRAC: 1-800-535-5053 (Toll-free in the U.S., Canada and the U.S. Virgin Islands); 352-323-3500 for calls originating elsewhere (Collect calls are accepted).
 - d. 3E COMPANY: 1-800-451-8346 (Toll-free in the U.S., Canada and the U.S. Virgin Islands); 760-602-8703 for calls originating elsewhere (Collect calls are accepted).
 - e. MILITARY SHIPMENTS: 703-697-0218 - Explosives/ammunition incidents (Collect calls are accepted); 1-800-851-8061 - All other dangerous goods incidents.
4. MEXICO:

- a. SETIQ: 01-800-00-214-00 in the Mexican Republic; For calls originating in Mexico City and the Metropolitan Area: 5559-1588; For calls originating elsewhere, call: 0-11-52-5-559-1588.
 - b. CECOM: 01-800-00-413-00 in the Mexican Republic; For calls originating in Mexico City and the Metropolitan Area: 5550-1496, 5550-1552, 5550-1485, or 5550-4885; For calls originating elsewhere, call: 0-11-52-5-550-1496, 0-11-52-5-550-1552, 0-11-52-5-550-1485, or 0-11-52-5-550-4885.
5. BRAZIL:
- a. PRO-QUIMICA: 0-800-118270 (Toll-free in Brazil); 55-11-232-1144 for calls originating elsewhere (Collect calls are accepted).
6. For additional details see the section entitled "WHO TO CALL FOR ASSISTANCE" under the ERG Instructions.
7. Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
8. Keep unauthorized personnel away.
9. Stay upwind.
10. Keep out of low areas.
11. Reference: ERG, 2000.
- C. When heated to decomposition, malononitrile emits highly toxic fumes. Effects of inhalation of toxic fumes will be related to cyanide. For small fires, use dry chemical, carbon dioxide, halon, water spray, or standard foam to extinguish. For large fires, use water spray, fog or standard foam to extinguish. Wear positive pressure breathing apparatus and special protective clothing.

10.1.6 FIRE CONTROL/EXTINGUISHING AGENTS

- A. SMALL FIRES - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
1. Dry chemical, CO₂ or water spray.
 2. Reference: ERG, 2000.
- B. LARGE FIRES - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
1. Dry chemical, CO₂, alcohol-resistant foam or water spray.
 2. Move containers from fire area if you can do it without risk.
 3. Dike fire control water for later disposal; do not scatter the material.
 4. Reference: ERG, 2000.
- C. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
1. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
 2. Do not get water inside containers.
 3. Cool containers with flooding quantities of water until well after fire is out.
 4. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
 5. ALWAYS stay away from tanks engulfed in fire.
 6. Reference: ERG, 2000.
- D. When heated to decomposition, malononitrile emits highly toxic fumes of cyanide and nitrogen oxides (EPA, 1985; Sax & Lewis, 1989).
- E. Malononitrile is metabolized by the body to cyanide and thiocyanate. The effects of inhalation of toxic fumes will be related to cyanide (EPA, 1985).
- F. Special fire fighting procedures: Move container from fire area if you can do so without risk.

Wear positive pressure breathing apparatus and special protective clothing (EPA, 1985).

10.1.7 COMBUSTION TOXICITY

- When heated to decomposition, malononitrile emits highly toxic fumes of cyanide and nitrogen oxides (Sax & Lewis, 1989). The effects of inhalation of toxic fumes will be related to cyanide (EPA, 1985).

10.2 EXPLOSION HAZARD

A. FIRE OR EXPLOSION HAZARDS - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153

1. Combustible material: may burn but does not ignite readily.
2. When heated, vapors may form explosive mixtures with air: indoors, outdoors, and sewers explosion hazards.
3. Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.
4. Contact with metals may evolve flammable hydrogen gas.
5. Containers may explode when heated.
6. Runoff may pollute waterways.
7. Substance may be transported in a molten form.
8. Reference: ERG, 2000.

B. PUBLIC SAFETY, GENERAL - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153

1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
 2. Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
 3. Keep unauthorized personnel away.
 4. Stay upwind.
 5. Keep out of low areas.
 6. Ventilate enclosed areas.
 7. Reference: ERG, 2000.
- C. Malononitrile may polymerize violently on heating at 130 degrees C, or in contact with strong bases at lower temperatures (Bretherick, 1985).
- D. No violent decomposition below 100 degrees C has been recorded. However, a partially filled drum of malononitrile stored in an oven at 70 to 80 degrees C for two months exploded violently (Bretherick, 1985).

10.3 DUST/VAPOR HAZARD

A. PUBLIC SAFETY, GENERAL - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153

1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
2. Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.

3. Keep unauthorized personnel away.
 4. Stay upwind.
 5. Keep out of low areas.
 6. Ventilate enclosed areas.
 7. Reference: ERG, 2000.
- B. When heated to decomposition, malononitrile emits highly toxic fumes of cyanide and nitrogen oxides (Sax & Lewis, 1989). The effects of inhalation of toxic fumes will be related to cyanide (EPA, 1985).
- C. Inhalation of dust is poisonous (HSDB, 1990).

10.4 REACTIVITY HAZARD

- A. Conditions to avoid: prolonged heating at 130 degrees C or contact with strong bases at lower temperatures (EPA, 1985; Bretherick, 1985).
- B. When heated to decomposition, malononitrile emits highly toxic fumes of cyanide and nitrogen oxides (EPA, 1985; Lewis, 1996).
- C. Hazardous polymerization of malononitrile may occur at high temperatures (EPA, 1985).

10.5 EVACUATION PROCEDURES

10.5.1 SUMMARY

- A. No specific Isolation - Protective Action Distances have been established for this substance.
- B. EVACUATION (FIRE) - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
1. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
 2. Reference: ERG, 2000.
- C. PUBLIC SAFETY, GENERAL - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE (COMBUSTIBLE)) - GUIDE 153
1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
 2. Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
 3. Keep unauthorized personnel away.
 4. Stay upwind.
 5. Keep out of low areas.
 6. Ventilate enclosed areas.
 7. Reference: ERG, 2000.
- D. There was no specific information on evacuation procedures for malononitrile in available references at the time of this review. Generally, the area of release should be isolated and access to the area should be denied (EPA, 1985).

10.6 CONTAINMENT/DISPOSAL GUIDELINES

10.6.1 SUMMARY

- A. SPILL OR LEAK, GENERAL - ERG2000 (SUBSTANCES - TOXIC AND/OR CORROSIVE

(COMBUSTIBLE)) - GUIDE 153

1. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
 2. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
 3. Stop leak if you can do it without risk.
 4. Prevent entry into waterways, sewers, basements or confined areas.
 5. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
 6. DO NOT GET WATER INSIDE CONTAINERS.
 7. Reference: ERG, 2000.
- B. Wear self-contained positive pressure breathing apparatus and special protective clothing. Isolate area and deny entry. Isolate spilled material for later disposal. For small spills, use sand or other noncombustible absorbent material. For large spills, dike far ahead of spill for later disposal (EPA, 1985).

10.6.2 SMALL LEAK/SPILL

- A. Wear self-contained positive pressure breathing apparatus and special protective clothing. Do not touch spilled material. Stop leak if you can do so without risk. Stay upwind and out of low areas. Isolate area and deny entry (EPA, 1985).

10.6.3 LARGE LEAK/SPILL

- A. Wear self-contained positive pressure breathing apparatus and special protective clothing. Do not touch spilled material. Stop leak if you can do so without risk. Stay upwind and out of low areas. Isolate area and deny entry (EPA, 1985).
- B. Dike far ahead of large spills for later disposal (EPA, 1985).

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12.0 PHYSICAL/CHEMICAL PROPERTIES

12.1 MOLECULAR WEIGHT

- A. 66.06 (Budavari, 1996)

12.2 DESCRIPTION/PHYSICAL STATE

- A. Malononitrile is a colorless, whitish, or yellowish, odorless, crystalline or powder solid aliphatic nitrile compound (EPA, 1985; Budavari, 1996; Sittig, 1985).

12.3 PH

- A. No information found at the time of this review.

12.5 SPECIFIC GRAVITY

- A. 1.1910 (at 20/4 degrees C) (OTHER-TP) (EPA, 1985)
B. 1.049 (at 34/4 degrees C) (OTHER-TP) (Lewis, 1996)

KEY

NL-TP: Not Listed, Temperature and Pressure
NTP: Normal Temperature and Pressure
(25 degrees C; 77 degrees F and 760 mmHg)
OTHER-TP: Other, Temperature and Pressure
STP: Standard Temperature and Pressure
(0 degrees C; 32 degrees F and 760 mmHg)

12.7 FREEZING/MELTING POINT

- A. MELTING POINT
1. 30.5-32 degrees C (EPA, 1985; HSDB, 1990; Sax & Lewis, 1989)
2. 90-93 degrees F (CHRIS, 1990; EPA, 1985)

12.8 BOILING POINT

- A. 218-220 degrees C (EPA, 1985; HSDB, 1990; Sax & Lewis, 1989)
B. 424-426 degrees F (EPA, 1985)

12.9 FLASH POINT

- A. 130 degrees C (EPA, 1985)
- B. 266 degrees F (EPA, 1985; Sax & Lewis, 1989)

12.12 SOLUBILITY

A. SOLUBILITY IN WATER

- 1. Malononitrile is poorly soluble in water (Budavari, 1996). Malononitrile's solubility in water is 13 g/100 mL (EPA, 1985).

B. SOLUBILITY IN SOLVENTS

- 1. Malononitrile is very soluble in alcohol and ether (Budavari, 1996). Malononitrile is also soluble in benzene (Hartung, 1982; HSDB, 1997) and acetone, acetic acid, and chloroform (HSDB, 1997).

12.13 REACTIVITY

12.13.2 HAZARDOUS REACTIONS

- A. Conditions to avoid: prolonged heating at 130 degrees C or contact with strong bases at lower temperatures (EPA, 1985; Bretherick, 1985).
- B. When heated to decomposition, malononitrile emits highly toxic fumes of cyanide and nitrogen oxides (EPA, 1985; Lewis, 1996).
- C. Hazardous polymerization of malononitrile may occur at high temperatures (EPA, 1985).

12.17 HENRY'S CONSTANT

- A. 1.0×10^{-7} atm-m(3)/mol (Ehrenfeld et al, 1986)